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(54) **LIGHT EMITTING DIODE LAMP**

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(58) **Field of Classification Search** 362/240, 362/244, 246, 249, 252, 237, 294, 326, 555, 362/800, 249.02
See application file for complete search history.

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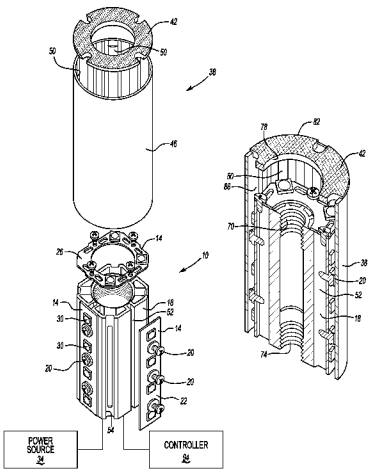
(57) **ABSTRACT**

An example light emitting diode bulb assembly includes a base having a first end portion and a second end portion defining an axis, a plurality of first light emitting diodes secured adjacent a plurality of first base surfaces about the axis, and at least one second light emitting diode secured adjacent a second base surface of the first end portion, wherein the second base surface is transverse to the plurality of first base surfaces.

8 Claims, 4 Drawing Sheets



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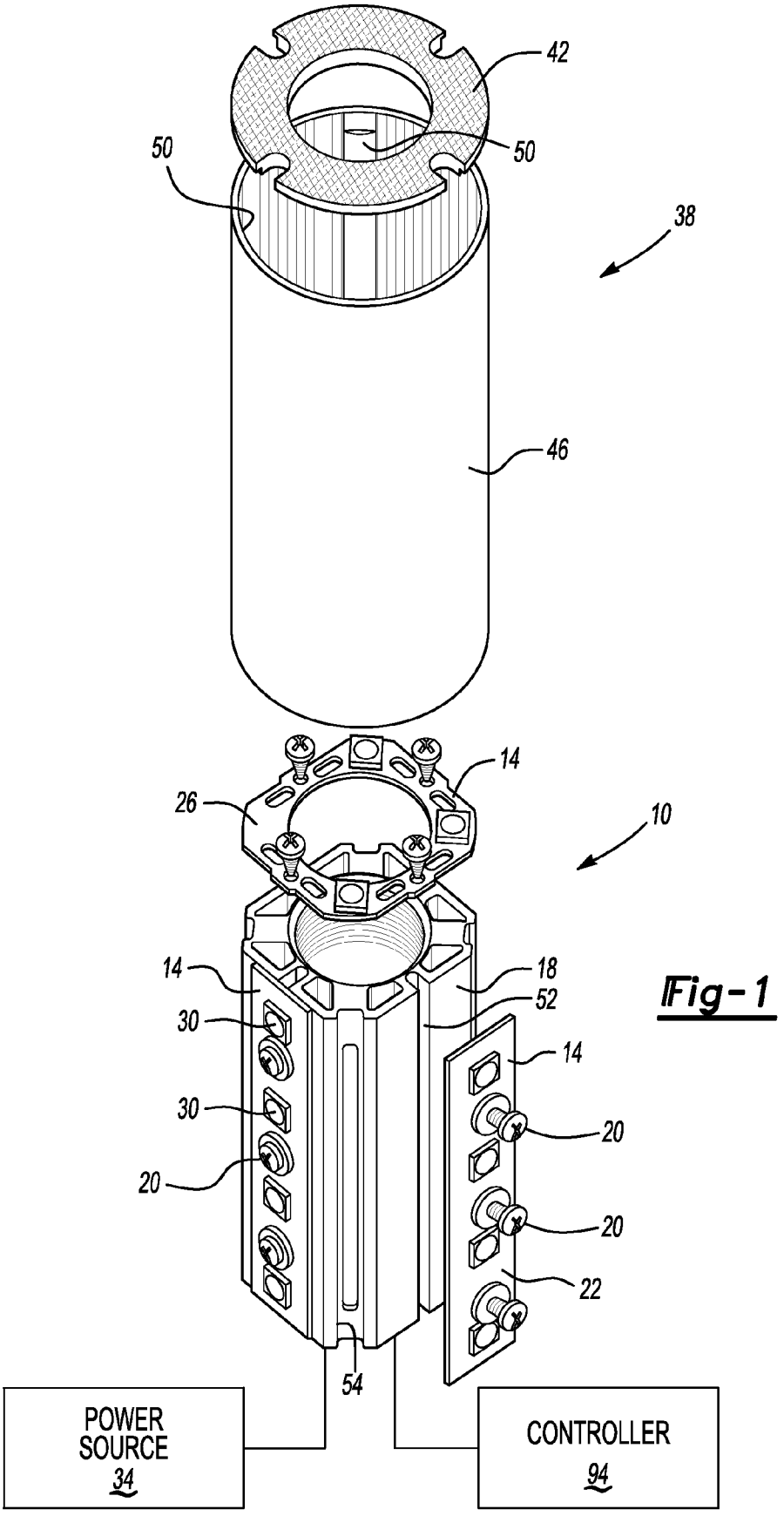
42
50
50
38
46
14
26
10
14
18
52
30
14
30
20
20
20
22
54
POWER SOURCE
34
CONTROLLER
94

Fig-1

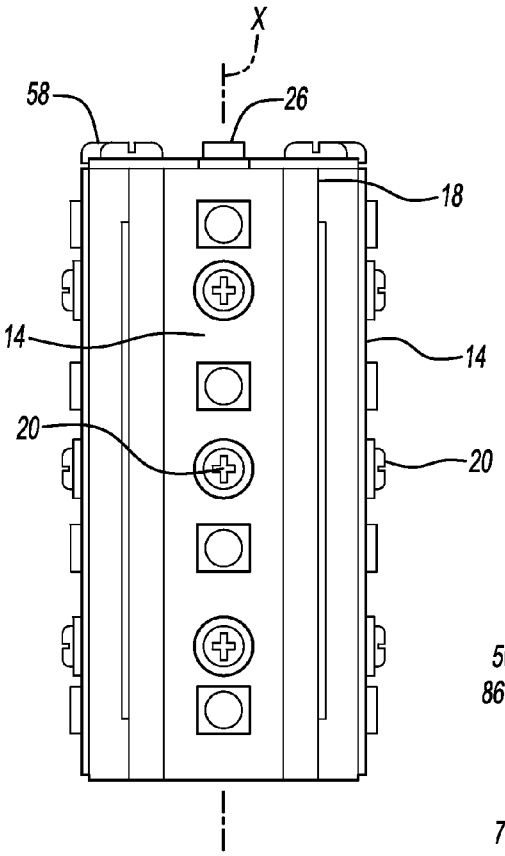

Fig-2

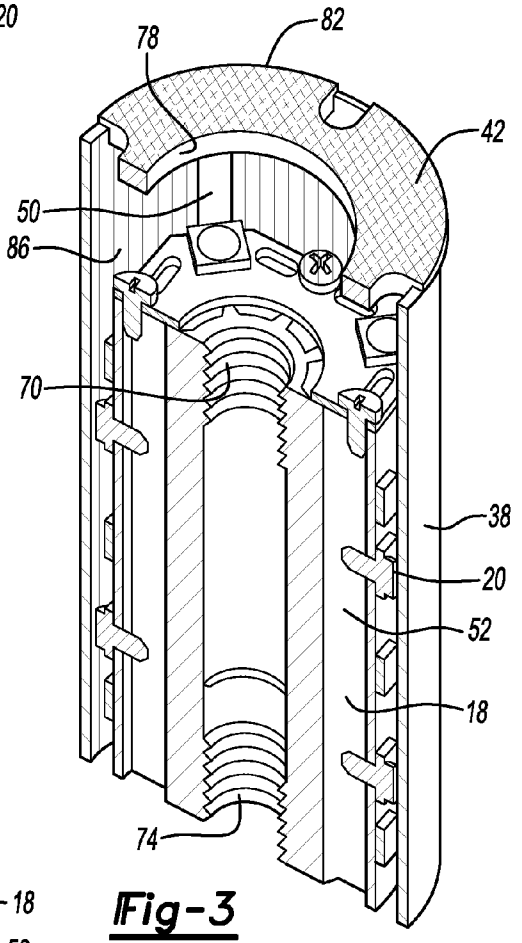

Fig-3

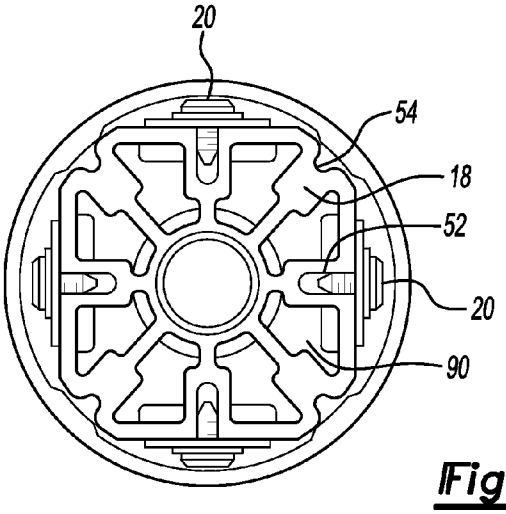

Fig-4

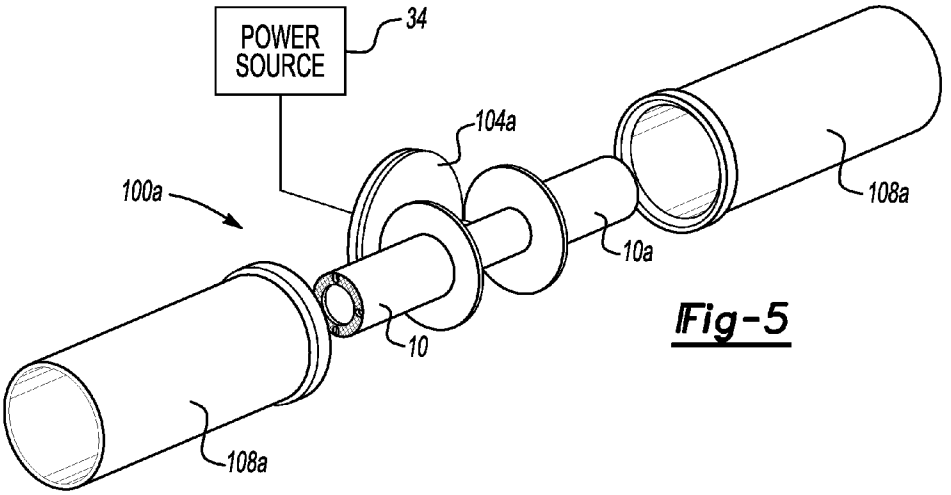
POWER SOURCE
34
104a
100a
108a
10a
10
108a

Fig-5

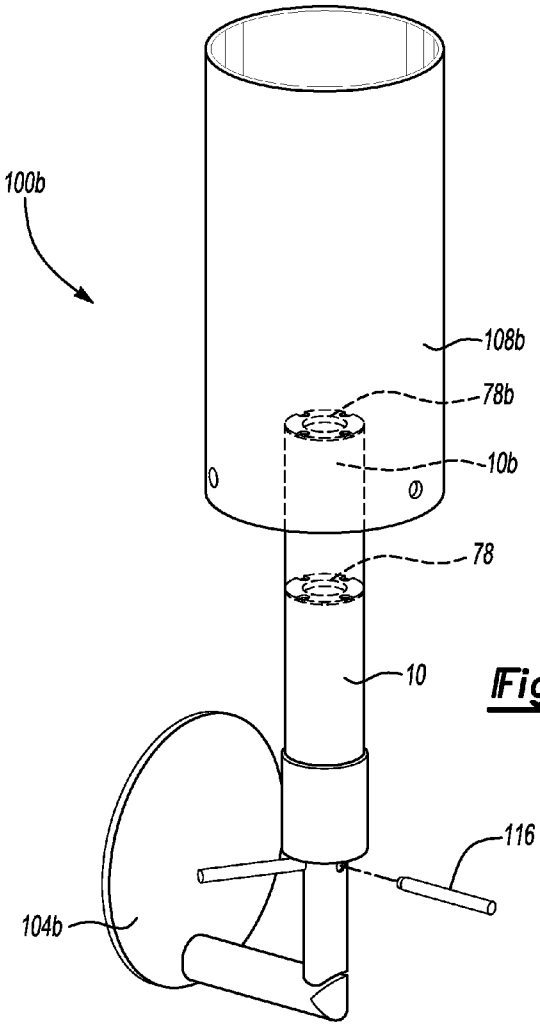
100b
108b
78b
10b
78
10
116
104b

Fig-6

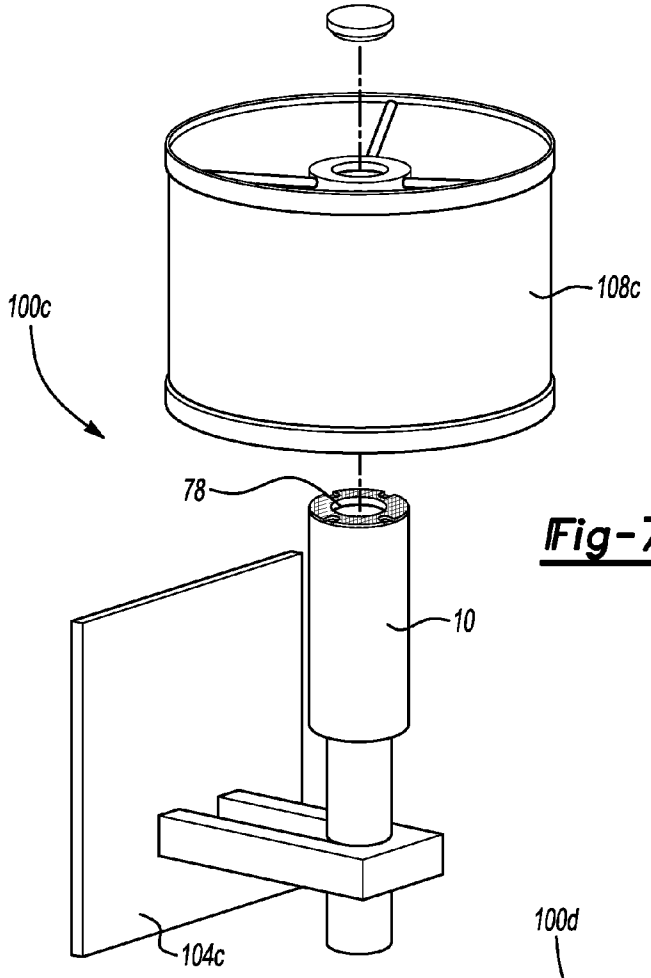

Fig-7

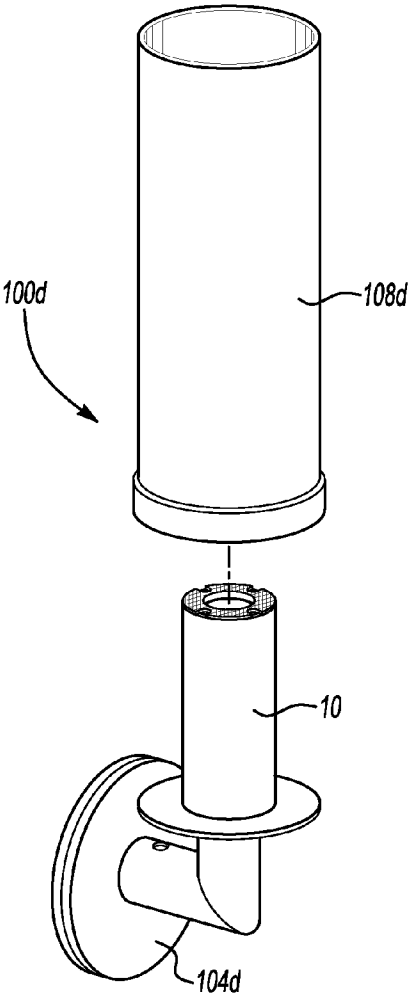

Fig-8

LIGHT EMITTING DIODE LAMP

BACKGROUND OF THE INVENTION

This invention generally relates to a lamp having a bulb that includes a plurality of light emitting diodes.

A light emitting diode (LED) is a known type of light emitting semi-conductor device. The emitted light may change color and intensity depending on the type of semi-conductor material. LED based lighting is typically more efficient than conventional lighting systems, such as a system utilizing an incandescent light bulb.

Incandescent light bulbs have a relatively short life span. Typically, the incandescent light bulb engages a threaded socket within an incandescent lamp. The conventional lighting system design must provide access for replacing the incandescent light bulb and must further accommodate the threaded socket. Thus, the conventional lighting system has limited design options. LED based lighting provides greater design freedom due in part to the efficiency and relatively small size of the LED.

Even though some recently developed types of LED generate more light than previous LED types, at least one LED is still typically required to generate to same amount of light as the incandescent light bulb. Distributing the light from more than one LED to mimic a traditional incandescent lighting pattern is often difficult as more than one LED may result in visible lighting "hot-spots" for example. LED based lighting also generates more thermal energy per watt than conventional lighting, which can overheat the system. Accordingly, previous attempts to replace conventional incandescent light bulbs with LED based lighting have proven ineffective.

SUMMARY OF THE INVENTION

An example light emitting diode bulb assembly includes a base having a first end portion and a second end portion defining an axis, a plurality of first light emitting diodes secured adjacent a plurality of first base surfaces about the axis, and at least one second light emitting diode secured adjacent a second base surface of the first end portion, wherein the second base surface is transverse to the plurality of first base surfaces.

An example light emitting diode lamp assembly includes a lamp fixture and a first bulb assembly. The first bulb assembly includes a bulb base having a first end and a second end defining an axis, a plurality of first light emitting diodes secured to the bulb base about the axis, and at least one second light emitting diode secured adjacent the first end.

The example bulb assembly may be extruded and may include aluminum. The base typically has a rectangular cross section. The bulb assembly may include at least one channel in the base. The channel is for communicating thermal energy between the first end portion and the second end portion. The channel may be located in an interior portion of the base. The first light emitting diodes and the second light emitting diode typically mount to a plurality of circuit boards.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

FIG. **1** illustrates a partially exploded view of an example LED bulb assembly.

FIG. **2** illustrates a side view of the bulb assembly of FIG. **1** with a lens portion removed.

FIG. **3** illustrates a cutaway view of the bulb assembly of FIG. **1** partially received within the lens portion.

FIG. **4** illustrates a bottom view of the bulb assembly of FIG. **1**.

FIG. **5** illustrates an example LED lamp assembly.

FIG. **6** illustrates another example LED lamp assembly.

FIG. **7** illustrates yet another example LED lamp assembly.

FIG. **8** illustrates yet another example LED lamp assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A bulb assembly **10** includes a plurality of circuit boards **14** and a base **18**, as shown in FIG. **1**. Fasteners **20** secure the circuit boards **14** to the base **18**. The circuit boards **14** include a plurality of side circuit boards **22** and a top circuit board **26**. Each of the circuit boards **14** includes at least one Light Emitting Diode (LED) **30**. The bulb assembly **10** connects to a power source **34**, which powers the circuit boards **14** and the at least one LED **30** in a known manner.

A lens **38** fits over the base **18**. The lens **38** includes a top lens portion **42** and a side lens portion **46**. Ribs **50** on the interior of the side lens portion **46** engage corner grooves **54** on the base **18** to secure the lens **38** relative to the base **18**. In this example, the corner grooves **54** slideably receive the ribs **50**.

The base **18** includes a top base portion **58** and a bottom base portion **62**, which define an axis X extending the length of the base **18** as shown in the FIG. **2** side view. The fasteners **20** secure the side circuit boards **22** to surfaces of the base **18** about the axis X while the top circuit board **26** secures to a surface of the top base portion **58**. The side circuit boards **22** in this example each include four of the at least one LED **30**, and the top circuit board **26** includes three of the at least one LED **30** (FIG. **1**).

The top circuit board **26** is arranged transverse to the side circuit boards **22**. Although shown in this example as a substantially perpendicular arrangement, other arrangements are possible. The top circuit board **26** may be arranged at a 45 degree angle to the side circuit boards **22** for example. Other examples may include more than one top circuit board **26**.

The cross-sectional view of FIG. **3** illustrates the fasteners **20** engaging a plurality of side groves **52** on the base **18**. Also shown is a top threaded portion **70** and a bottom threaded portion **74**, which provide engagement features adjacent the top base portion **58** and the bottom base portion **62**. The top threaded portion **70** and the bottom threaded portion **74** may each connect to another bulb assembly, a lamp shade or a similar threaded accessory. A person skilled in the art and having the benefit of this disclosure would be able to develop threaded or similar attachments for joining the top threaded portion **70** and the bottom threaded portion **74** to an adjacent accessory or the threaded portion of another bulb assembly.

The top lens portion **42** of the lens **38** includes a lens opening **78** permitting access to the top threaded portion **70** through the top lens portion **42**. In this example, the top lens portion **42** includes grid texture **82** while the side lens portion includes a plurality of prismatic flutes **86**. The grid texture **82** and the prismatic flutes **86** may alter the light pattern from the LED **30** as the light passes through the lens **38**. The grid texture **82** and the prismatic flutes **86** may be modified to redistribute light from the LED **30** to mimic light patterns of common light bulbs, such as A-bulb incandescent light. The grid texture **82** and the prismatic flutes **86** distribute the LED light so that lighting hot-spots are not easily perceived when viewing the bulb assembly **10**.

The circuit boards **14** generate thermal energy when powering the LED **30**, which may overheat the circuit boards **14**. The base **18** in this example is a metal base such as aluminum, which conducts thermal energy from the circuit boards **14**. The interior of the base **18** includes channels **90** and has a generally rectangular cross-section as shown in the bottom view of FIG. **4**. The channels **90** extend between the bottom base portion **62** to the top base portion **58** and are substantially aligned with the axis X.

The channels **90** provide a path for thermal energy to move through the base **18**. Typically, thermal energy moves from circuit boards **14**, through the base **18**, and to the space within the channels **90**. The thermal energy next moves from the bottom of base portion **62** to the top base portion **58**. After exiting the channel **90** near the top base portion **58**, thermal energy moves through the lens opening **78** and escapes into the surrounding environment.

In this example, the base **18** is an extruded base, which facilitates forming the side grooves **52**, the corner grooves **54**, and the channels **90**. Adjusting the extrusion operation changes the overall length of the base **18**. The side grooves **52** provide fastening location for the fastener **20** to secure the circuit boards **14** to the base **18**. Accordingly, no secondary operation, such as drilling holes, etc., is needed to provide an attachment location for the fasteners **20**. The corner grooves **54** provide recessed areas for receiving the ribs **50** on the interior of the side lens portion **46** (FIG. **1**).

A controller **94** may connect to the bulb assembly **10**. As known, controllers **94** could be used to change the lighting intensity and patterns of the at least one LED **30**. In this example, the controller **94** may provide dimming capability to the at least one LED **30** by intensifying or reducing the intensity of the at least one LED **30** within the respective circuit boards **14**. In another example, the circuit boards **14** include at least one multiple colored LED **30**. The controller **94** adjusts the color of light from the bulb assembly **10** by changing the intensity of the lighted LED **30** or the number and arrangement of the lighted LED **30***s*. The controller **94** may include a switch, such as a standard wall switch, a dimmer switch, a three-position switch, a low voltage switch, an RF switches, or a touch style switch.

A lamp assembly **100***a* may include the bulb assembly **10** and a second bulb assembly **10***a*, as shown in the example lamp assembly **100***a* of FIG. **5**. The lamp assembly **100***a* is a horizontal sconce lamp for illuminating an area within a home, such as a bathroom, hallway, or other residential area, for example. Each bulb assembly **10**, **10***a* attaches to a fixture **104***a* that connects to a power source **34**. At least one shade attachment **108***a* fits over each bulb assembly **10**, **10***a* to provide a decorative accessory and further distribute light from the bulb assembly **10**. As each bulb assembly **10**, **10***a* generates light using the at least one LED **30**, the lamp assembly **100***a* has a longer useable life prior to replacing the lighting source than incandescent bulb based light sources. In one example, if either bulb assembly **10**, **10***a* fails, a user purchases another lamp assembly **100***a* rather than replace the bulb assembly **10**, **10***a*.

Another example lamp assembly **100***b* is the vertical wall sconce of FIG. **6**. The lamp assembly **100***b* includes a second bulb **10***b* that secures to the bulb assembly **10** through the lens opening **78**. The second bulb **10***b* includes a threaded connection for connecting to the top threaded portion **70** (FIG. **3**) of the bulb **10**. A shade **112***b* fits over each bulb assembly **10**, **10***b* and may also contain a threaded connection (not shown) for engaging the top threaded portion **70** of the bulb **10***b*. A pin **116** secures the shade **112***b* to the fixture **104**.

FIGS. **7** and **8** illustrate two other examples of the lamp assembly **100***c*, **100***d* including the bulb assembly **10** secured to the respective fixture **104***c*, **104***d*. The shades **108** attach typically to the top threaded portion **70** through the lens opening **78**. Known methods exist for attaching a shade **108** to a threaded female portion.

Of course, although shown as attaching shades **108***a*-**108***d* to the top threaded portion **70** through the lens opening **78**, other examples may include attaching a second bulb assembly **10** to the top threaded portion **70**. In so doing, the overall length of the bulb assembly **10** increases due to the added bulb assembly **10**.

Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

We claim:

1. A light emitting diode bulb assembly, comprising:

a base having a first end portion and a second end portion defining an axis;

a plurality of first light emitting diodes secured adjacent a plurality of first base surfaces about said axis; and

at least one second light emitting diode secured adjacent a second base surface of said first end portion, wherein said second base surface is transverse to said plurality of first base surfaces, wherein said first end portion includes a first feature for securing said base to one of a fixture or a second bulb assembly and said second end portion includes a second feature for securing said base to the other of said fixture or said second bulb assembly, wherein the first feature and the second feature are both recessed female-type attachment features.

2. The bulb assembly of claim **1**, wherein said base is extruded.

3. The bulb assembly of claim **1**, including a first lens, wherein at least one of said lens or said first base surface includes a groove for slideably receiving an extension from the other of said lens or said base.

4. The bulb assembly of claim **3**, including a second lens mounted transverse to said first lens, said second lens configured to alter light from said at least one second light emitting diode.

5. The bulb assembly of claim **3**, including a second lens distinct from said first lens and configured to alter light from said at least one second light emitting diode.

6. The bulb assembly of claim **1**, wherein said first feature and said second feature each include a threaded portion.

7. The bulb assembly of claim **1**, wherein said first feature and said second feature are each configured to receive a threaded attachment.

8. The bulb assembly of claim **1**, wherein said second base surface defines a groove for receiving a fastener that holds at least one of said plurality of first light emitting diodes.

* * * * *